

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.

1. REPORT DATE (DD-MM-YYYY) 2. REPORT TYPE
Technical Papers 3. DATES COVERED (From - To)

4. TITLE AND SUBTITLE 5a. CONTRACT NUMBER
5b. GRANT NUMBER
5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S) Please see attached 5d. PROJECT NUMBER
2302 5e. TASK NUMBER
MIG2 5f. WORK UNIT NUMBER
346120

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) 8. PERFORMING ORGANIZATION
REPORT
Air Force Research Laboratory (AFMC)
AFRL/PRS
5 Pollux Drive
Edwards AFB CA 93524-7048

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) 10. SPONSOR/MONITOR'S
ACRONYM(S)
Air Force Research Laboratory (AFMC)
AFRL/PRS
5 Pollux Drive
Edwards AFB CA 93524-7048 11. SPONSOR/MONITOR'S
NUMBER(S)
Please see attached

12. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for public release; distribution unlimited.

13. SUPPLEMENTARY NOTES

14. ABSTRACT
20030128 227

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT A	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON Leilani Richardson
a. REPORT Unclassified	b. ABSTRACT Unclassified	c. THIS PAGE Unclassified			19b. TELEPHONE NUMBER (include area code) (661) 275-5015

230211G2

MEMORANDUM FOR PRS (In-House Publication)

FROM: PROI (STINFO)

24 July 2001

SUBJECT: Authorization for Release of Technical Information, Control Number: **AFRL-PR-ED-VG-2001-168**
C.T. Liu and J. Gonzalez (Clinical Micro Sensors), "Hybrid Experimental-Numerical J-Integral Analysis
and Crack Growth Resistance of a Particulate Composite Material (Keynote Lecture)"

International Conf. on Computational Science and Engineering
(Puerto Vallarta, Mexico, 20-24 August 2001) (Deadline: 14 Aug 2001)

(Statement A)

1. This request has been reviewed by the Foreign Disclosure Office for: a.) appropriateness of distribution statement, b.) military/national critical technology, c.) export controls or distribution restrictions, d.) appropriateness for release to a foreign nation, and e.) technical sensitivity and/or economic sensitivity.
Comments: _____

Signature _____ Date _____

2. This request has been reviewed by the Public Affairs Office for: a.) appropriateness for public release and/or b) possible higher headquarters review.
Comments: _____

Signature _____ Date _____

3. This request has been reviewed by the STINFO for: a.) changes if approved as amended, b.) appropriateness of references, if applicable; and c.) format and completion of meeting clearance form if required
Comments: _____

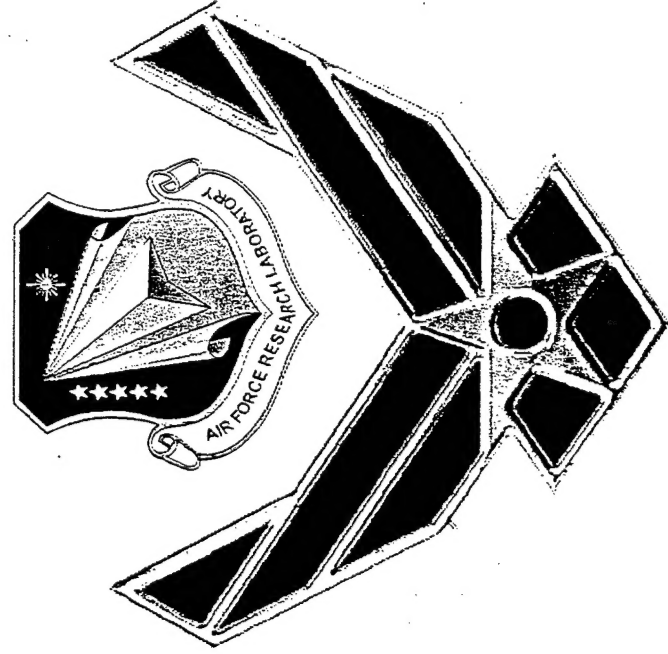
Signature _____ Date _____

4. This request has been reviewed by PR for: a.) technical accuracy, b.) appropriateness for audience, c.) appropriateness of distribution statement, d.) technical sensitivity and economic sensitivity, e.) military/national critical technology, and f.) data rights and patentability
Comments: _____

APPROVED/APPROVED AS AMENDED/DISAPPROVED

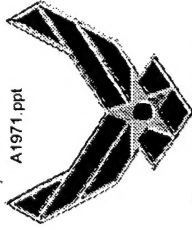
PHILIP A. KESSEL Date
Technical Advisor
Space and Missile Propulsion Division

HYBRID EXPERIMENTAL- NUMERICAL J-INTEGRAL ANALYSIS AND CRACK GROWTH RESISTANCE OF A PARTICULATE COMPOSITE MATERIAL



**C.T Liu
AFRL/PRSM
10 E. Saturn Blvd
Edwards AFB, CA 93524-7680**

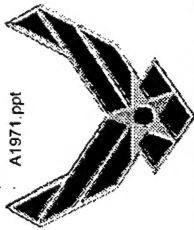
**Javier Gonzalez
Clinical Micro Sensors
757 South Raymond Ave.
Pasadena, CA 91105**



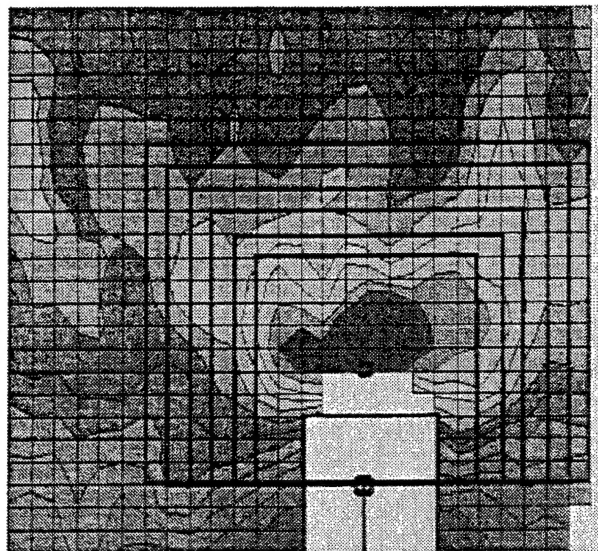
Objectives



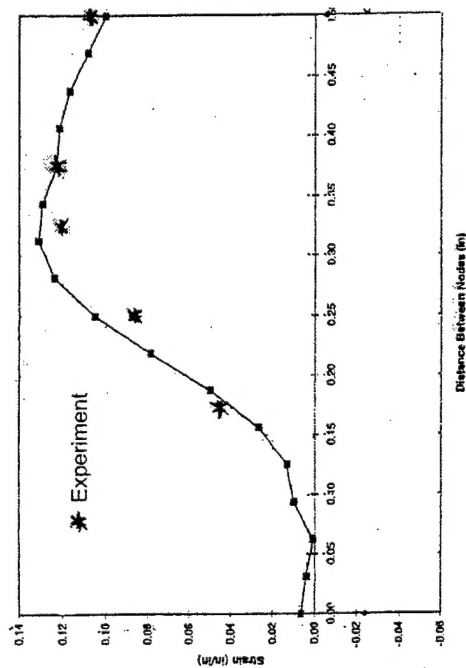
- Investigate the Inhomogeneous Nature of the Microstructure.
- Determine J-Integral Using a Hybrid Experimental-Numerical Technique.
- Investigate Crack Growth Behavior.



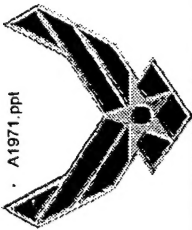
A1971.ppt



Normal Strain Along an Integration Path

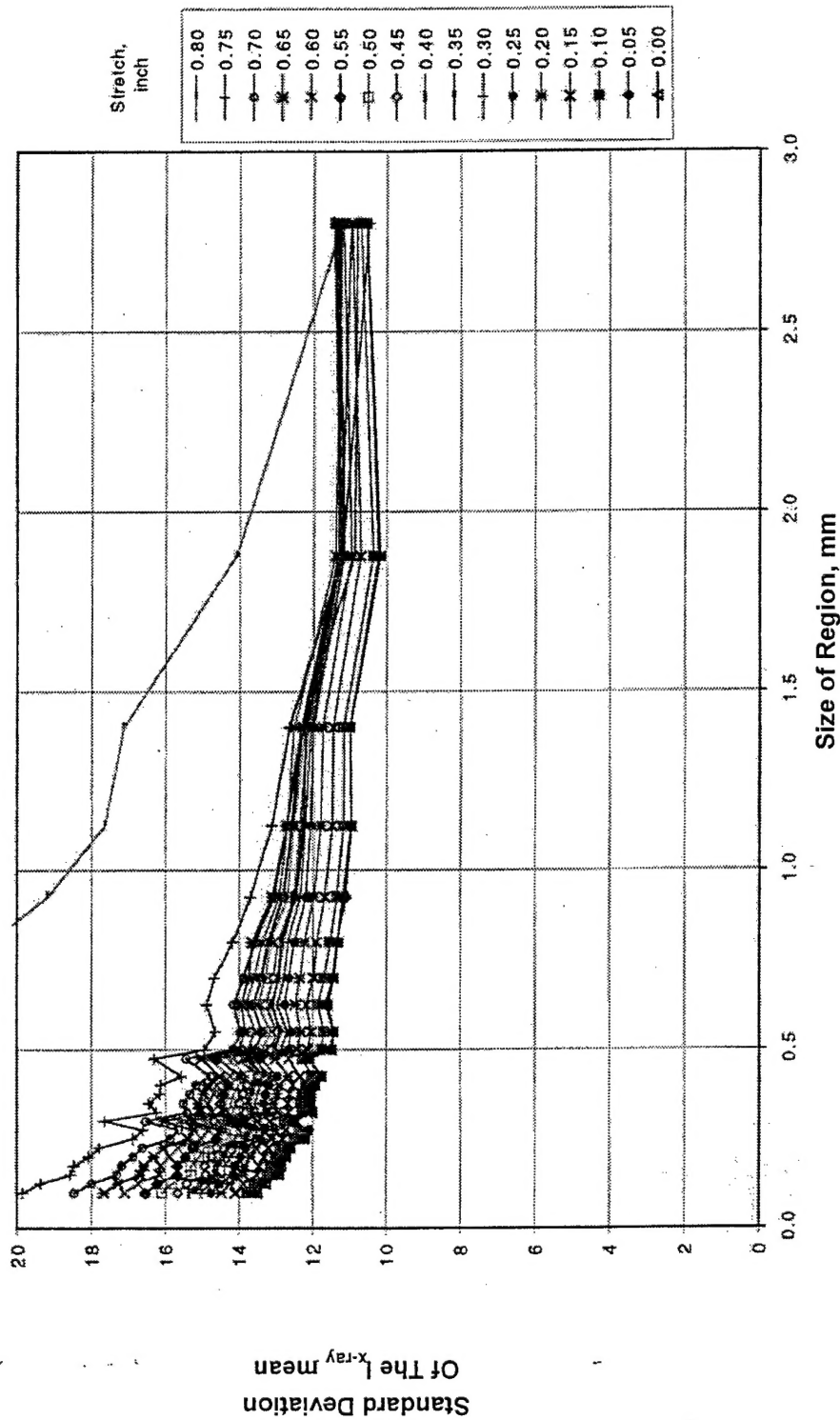


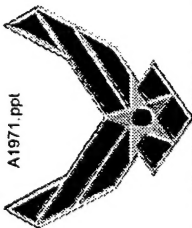
Strain Distributions and Integration Paths



A1971.ppt

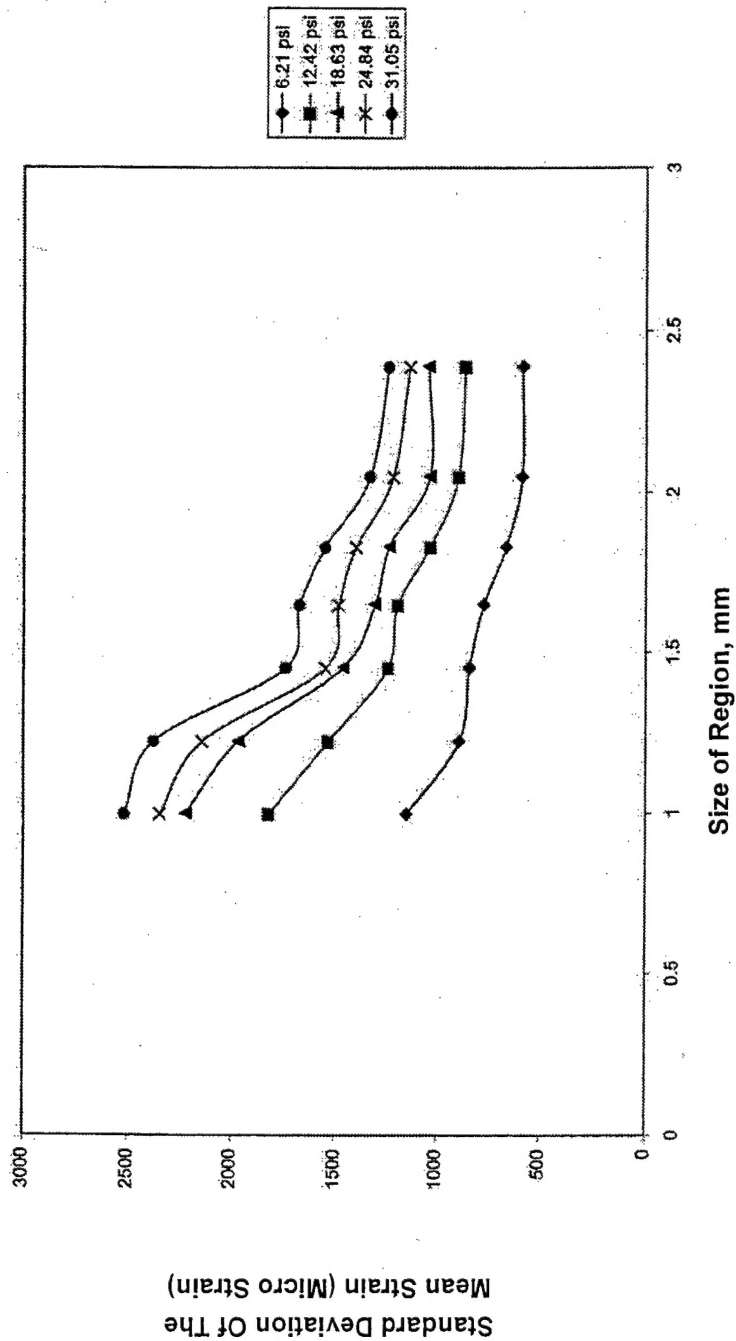
Standard Deviation of X-Ray Intensity Versus Size of Region as a Function of Applied Deformation

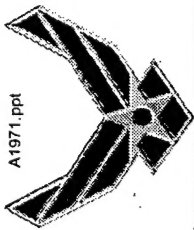




Standard Deviation of Strain Versus Size of Region as a Function of Applied Stress

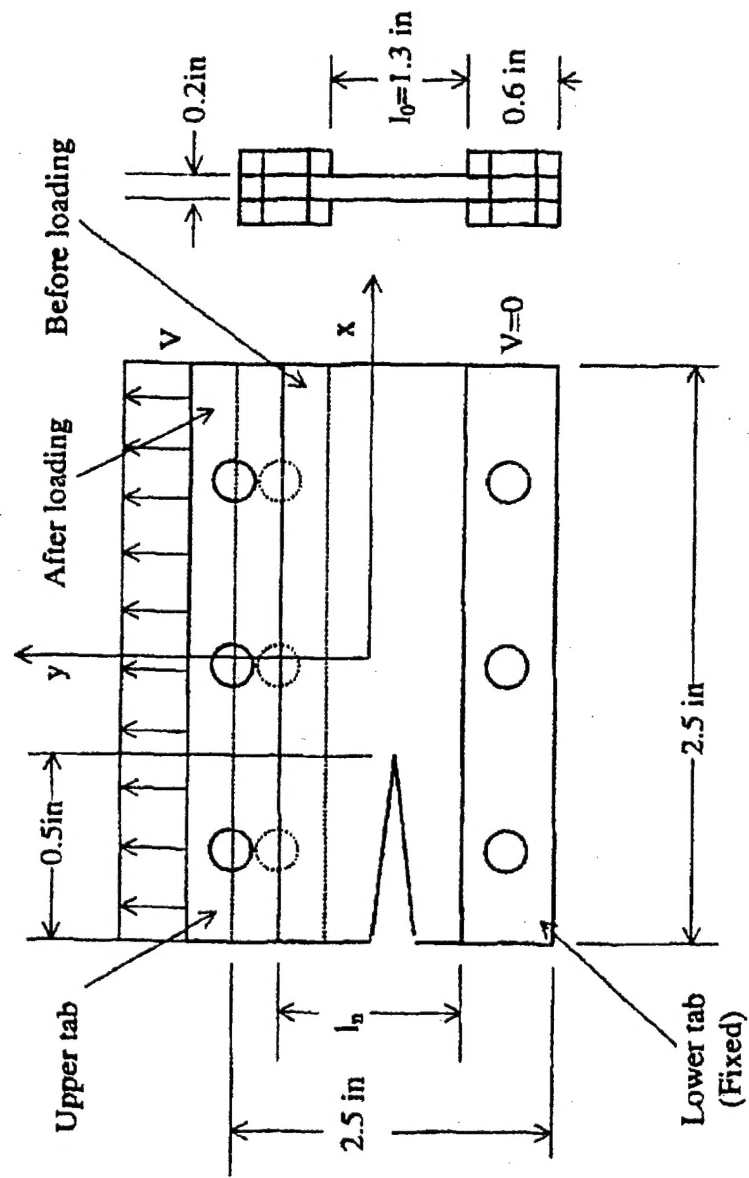
STD vs. Size of Region

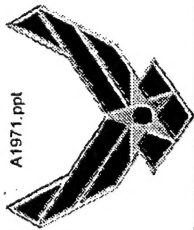




A1971.ppt

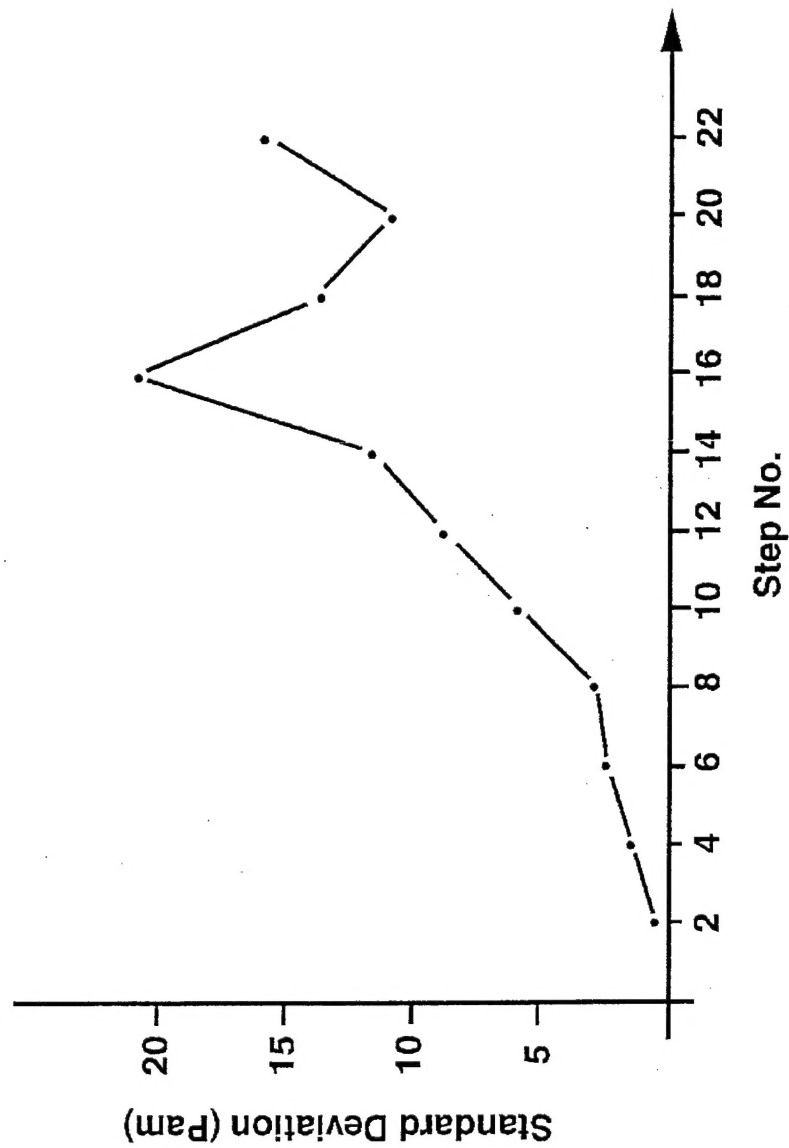
Specimen Geometry

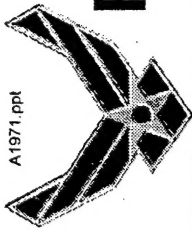




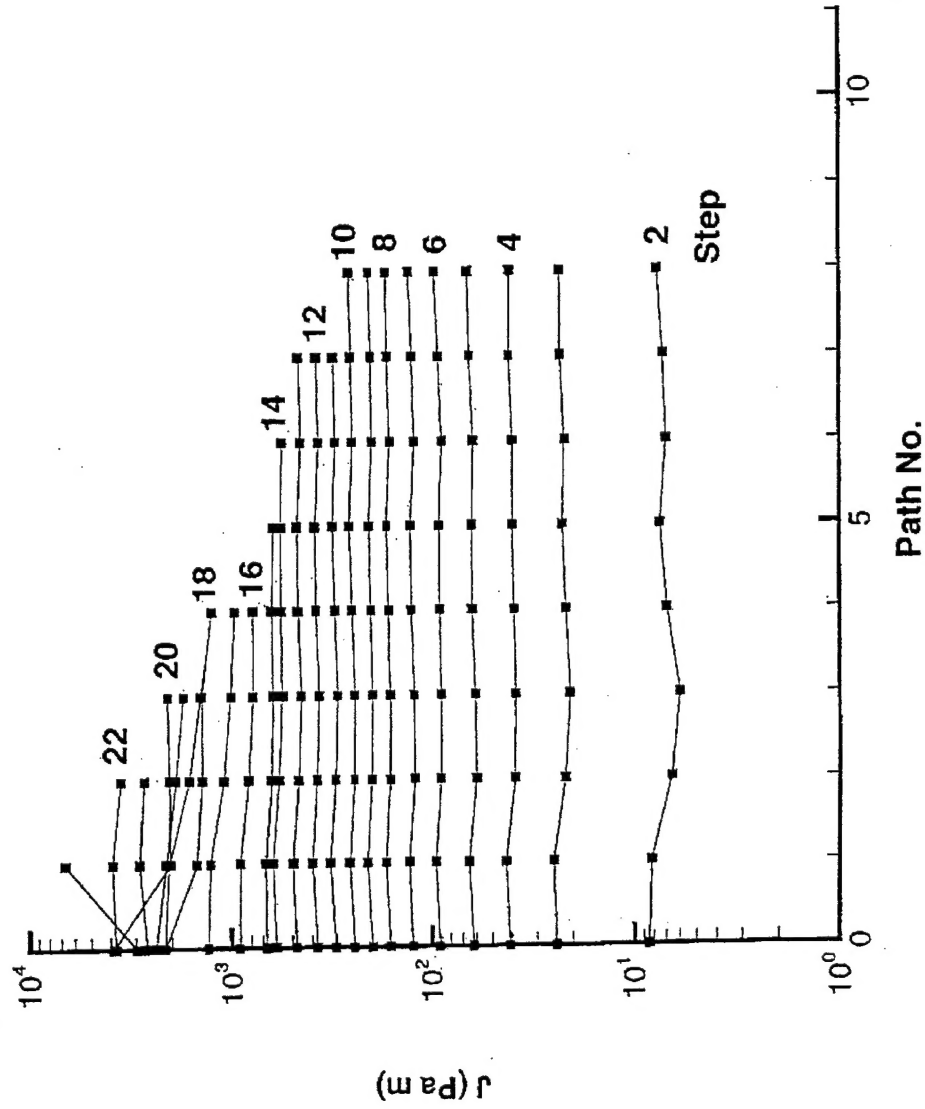
A1971.ppt

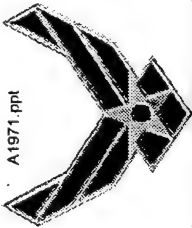
Standard Deviation of J-Integral Versus Step Number (Applied Strain)



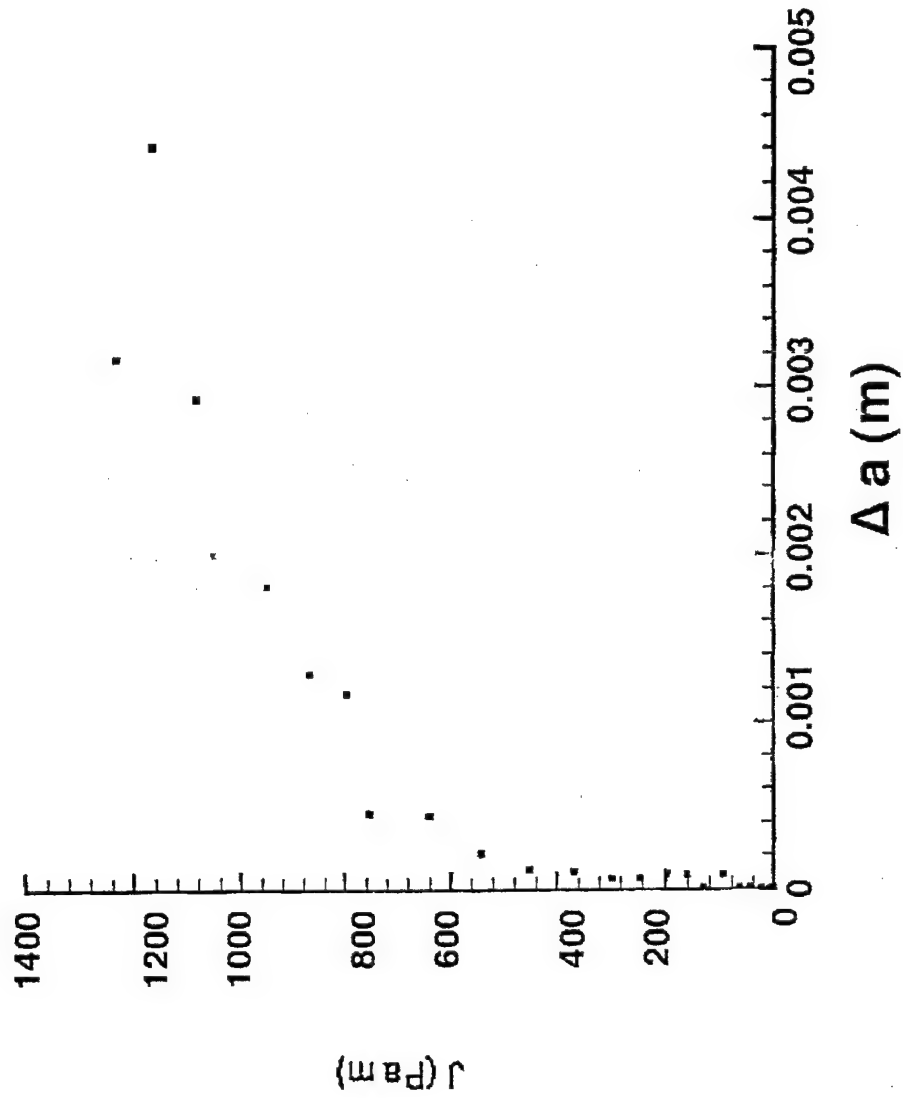


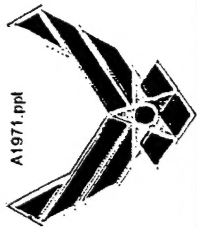
J-Integral Versus Path Number as a Function of Step Number (Applied Strain)



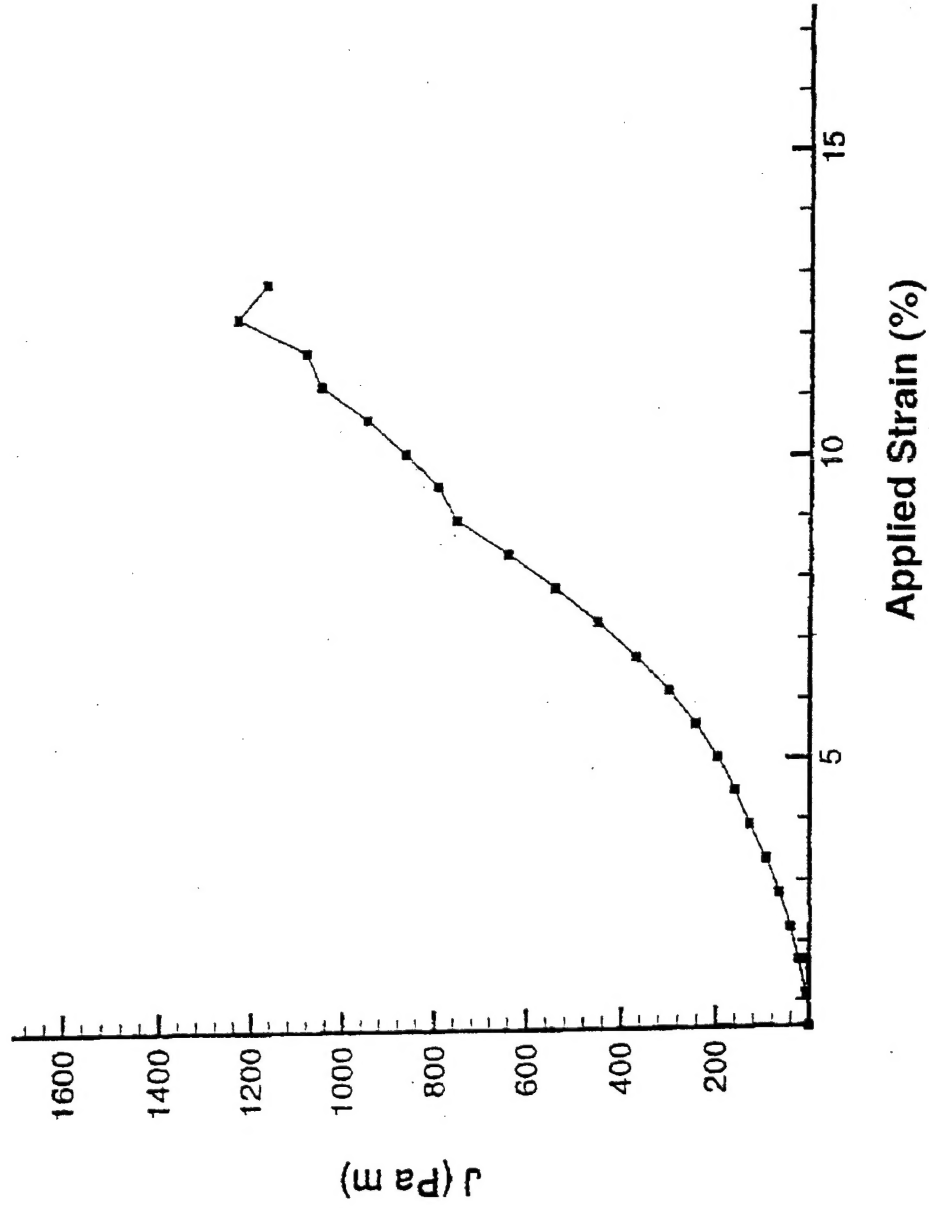


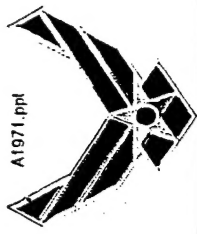
Crack Growth Resistance Curve



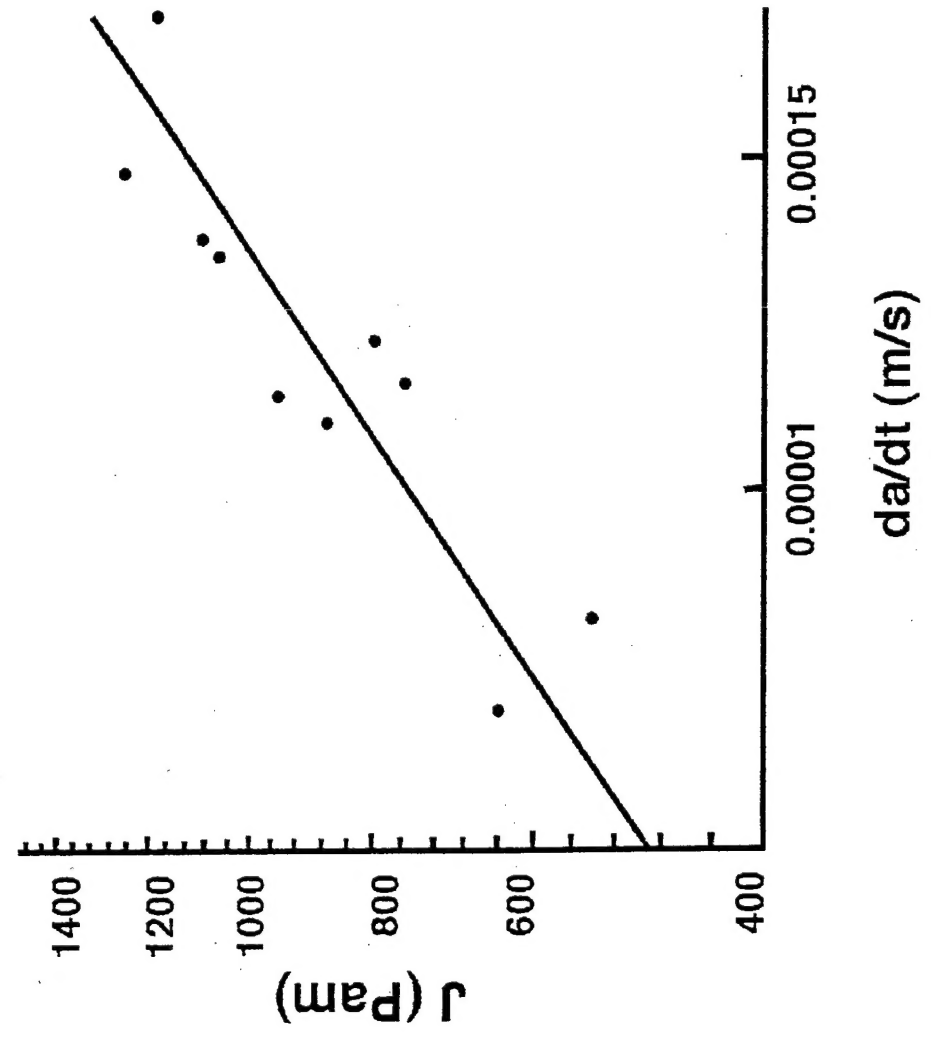


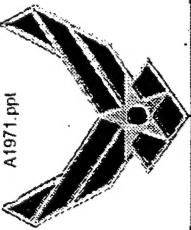
J-Integral Versus Applied Strain



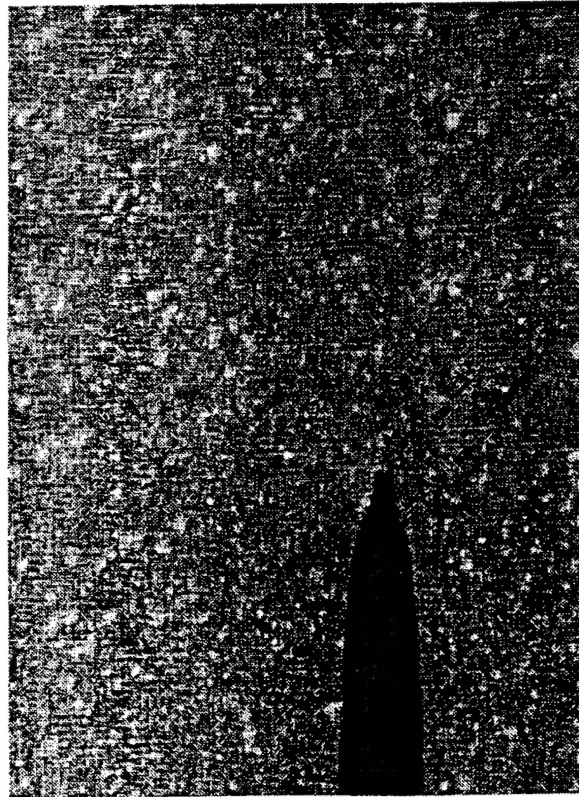


Crack Growth Rate Versus J-Integral

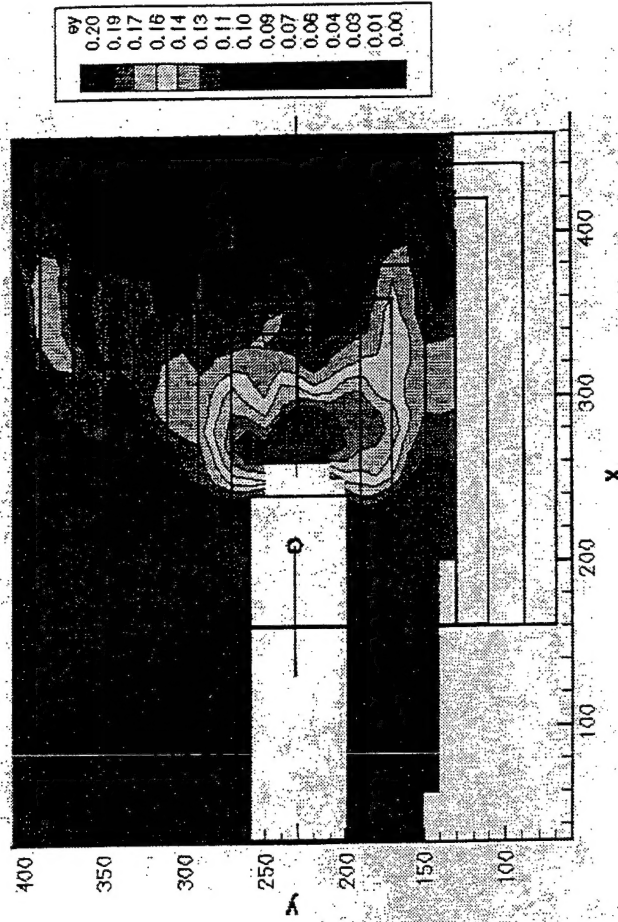




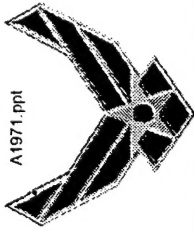
A1971.ppt



Deformed Image



Strain Distributions and
Integration Paths



A1971 ppt

Conclusions



- The minimum area for a valid homogeneous continuum assumption of the particulate composite material is 2 mm x 2 mm.
- On the macroscopic scale, the J-Integral is independent of the integration path.
- A power law relationship exists between the J-Integral and the crack growth rate.